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Radio Protective Potential of Medicinally Important Indian Bamboo Plants against Cancer

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Abstract – Cancer, the feared non-communicable disease, contributes to total deaths worldwide by a staggering 16 percent. Despite the huge developments in medical research, cancer continues to pose an impregnable threat for global health care systems with its massive economic burden increasing to around $1.16 trillion. In reality, plant-based cancer prevention therapy is largely considered safe because it prevents the side effects normally associated with other forms of cancer treatment such as chemotherapy and radiotherapy, etc. Bamboo shoots, the bamboo plant's highly palatable juvenile culms that have proven nutritional credentials, have rich repositories of several phytochemicals such as phenolic compounds, dietary fibres, phytosterols, and several other functional groups known to have anti-cancer properties.

Keywords: Cancer Prevention, Bamboo Shoots, Phytochemicals, Phenols, Phytosterols, Dietary Fibre

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INTRODUCTION

For the radio-protective effect against cellular damage caused by ionizing radiation, medicinal plants were explored[1],[2]. In both in vivo and in vitro models, the number of herbal preparations, both in wholesome form of complete extract or their components, has been shown to provide protection against radiation[3]. The bamboo plant is native to Asian countries, and after China, India is the world's second-largest bamboo reserve. For over 1000 years, bamboo leaves have been used for the diagnosis of fever and detoxification in traditional Chinese medicine[4]. Bamboo leaves are a natural medicine for many diseases such as leprosy, hematemesis, haemoptysis, nausea, cough, dysmenorrhea, amenorrhea, osteoporosis, vomiting, dyspepsia, flatulence and worm problems[5].

Plants used in traditional medicine have been up to the test of time and have contributed to modern science with many new compounds for preventive and curative medicine. India sits on a well-recorded gold mine of historically well-practiced herbal medicine awareness. In particular, in Himalayan pastures, plants growing at high altitude are time-honored sources of health and general well-being for local people. [6]

As of today, Himalayan plants have been a major contributor to both India and other countries ' herbal pharmaceutical industry. Plants growing at higher altitudes are subject to a number of research conditions, including higher doses of mutagenic UV radiation, physiological stress, desiccation, and strong winds. Via physiological adaptation, plants deal with stressful environments and alter the biochemical profile of plant tissues and develop a variety of secondary metabolites. Due to their distinct pharmacophores and medicinal properties, secondary metabolites are of particular interest to scientists.

According to many studies, secondary metabolites such as polyphenols, terpenes and alkaloids have antimutagenic and anticancer properties. [7] The fundamental aspiration of the current review is to divulge the antimutagenic/anticancer potential of five alpine plants used as food or medicine by the populations living at high altitudesIndia is the largest producer of medicinal plants and is rightly called the "Botanical garden of the World".

The medicinal plants also provide high quality food and raw materials for survival, in addition to having natural therapeutic qualities against various diseases. Considerable work has been done on these plants to treat cancer and on the basis of conventional applications and scientific reports, certain plant products have been advertised as anticancer drugs.

Such plants can promote host immunity to infection by restoring body balance and conditioning the tissues of the body. Many studies identify the role of antioxidants in the anti-cancer activity of medicinal plants. In fact, compared to modern (allopathic) medicines, medicinal plants are easily available, cheaper, and have no toxicity. This review article therefore includes 66 medicinal plants, the natural

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sources of anticancer agents. Cancer is an abnormal development and cell proliferation (malignant tumour). It is a terrifying illness because many physiological mechanisms cause the patient to suffer pain, disfigurement and impairment.

Cancer can be uncontrollable and incurable and can occur in any part of the body at any time at any age. It is caused by a complex interplay of genetic and environmental factors that is poorly understood. It continues to be the world's largest cause of death, claiming more than 6 million. Cancer kills around 3,500 per million of the world's population every year. A large number of chemopreventive agents are used to cure different cancers, but they produce side effects that prevent their widespread use.

Although more than 1,500 anticancer drugs are in active development under clinical trials with more than 500 of the drugs, there is an urgent need to produce far more effective and less toxic drugs that the plant kingdom plays an important role in human and animal life. India is the largest producer of medicinal plants and is properly referred to as the World's Botanical Garden. Medicinal plants[8] contain approximately 8,000 species and constitute approximately 50% of India's higher flowering plant species. In other words, the flowering plants have about 400 families; India contains at least 315. There have been reports of medicinal properties of few such plants, but a good number of plants still used by local folklore are still to be explored. Medicine systems Ayurveda, Siddha and Unani provide a good basis for scientific exploration of naturally occurring medically important molecules.

Ayurveda's rediscovery is a feeling of being redefined as modern medicines. Globally appropriate is the new idea of integrating Ayurveda with advanced drug discovery. Traditional medicine, throughout the world, has a long history of serving people. Ethnobotany is a rich area for research and development of natural medicines. In recent years, there has again been considerable interest in using traditional medicine information on plant research. The Western use of such information has also been increasingly scrutinized and most academic and industrial researchers have recognized the national and indigenous rights to these resources.

According to the World Health Organization (WHO), about three quarters of the world's population are actually using herbs and other types of traditional medicines for disease care. Modern drugs in India are commonly used. In the last two decades, plant and phytomedicine use has increased dramatically even in the US[9]. It has been also reported[7] that more than 50% of all modern drugs in clinical use are of natural products, many of which have been recognized to have the ability to include apoptosis in various cancer cells of human origin.

PLANTS USED FOR CANCER TREATMENT

Cancer is often fatal, affecting a significant number of people around the world. Worldwide, ongoing research is being done to find effective cancer treatments, including the use of plants to relieve and treat patients with cancer. The compounds naturally found in plants known to suppress or destroy carcinogenic cells are used in this procedure. The alternative to chemotherapy, the most common method of treating cancer by doctors and specialists, organic therapies may not have the severe side effects of radial treatments and chemotherapy. One motivating factor in finding alternative approaches is the harsh side effects of cancer treatments. Botanical use when treating patients with cancer is considered a natural alternative, as some plants may contain properties that naturally have the ability to prevent the spread or the risk of developing different forms of cancer. In the analysis of the various compounds found in plants known to treat cancer, careful precautions and measures are taken as in all medical tests. Several examples of plants that can be used to treat cancer are listed below with their development. Many side effects are still anticipated, and it is important to seek advice from a licensed medical practitioner from any patient interested in seeking botanical care. There are about 460 plant species that can be used as a remedy herb, including various cancer types for plant healers. Various types of anti-cancer plant are Zedoary (Curcuma zedoaria), Rodent Tuber (Typhonium flagelliforme), God’s Crown (Phaleria macrocarpa), Madagaskar Periwinkle (Catharanthus rosens), Artocarpus Integer (Selaginella corymbosa), Bamboo Grass (Loathatreum Gràcies) , handsome (Taraxacum mongolicum), fruit makasar (Brucca javanica), Garlic (Allium sativum), Echo China (Smilax china), Sunflower (Helianthus annus), Leunca (Solanum nigrum), Job’s Tears (Coix Lachryma-Jobi), Bamboo Rope (Asparagus cochinchinensis), and others.

PHYTOCHEMICALS IN BAMBOO SHOOTS AND THEIR ANTI-CANCEROUS PROPERTIES

Bamboo shoots contain several phytochemicals which have been proven to have potent anti-cancerous properties such as phytosterols, phenols and dietary fibres. These phytochemicals and their cancer protective effects have been discussed here as below:-

PHYTOSTEROLS

PHYTOSTEROLS ARE PLANT-BASED ALCOHOLS OF CARBON STEROID C28 AND C29. SUCH CHEMICALS HAVE A structural similarity to cholesterol, differing only on the basis of the presence or absence of dual bonds and/or length of carbon side chains and the form of functional groups that are attached. Phytosterols are structurally

similar to cholesterol and also serve the same role in plant cells as cholesterol performed in animal cells, which is the stabilization of plant cell membranes ' phospholipid bilayer.

Phytosterols are either present inside plant cell membranes in a bounded esterified form or are freely present in the cytoplasm. Either in the original form of sterol or their saturated equivalents known as stanols may exist. There have been studies of more than 200 different types of phytosterols in plants so far, but the most commonly found phytosterols in edible plant foods include βsitosterol, campesterol, and stigmasterol (13). Because humans can not synthesize such compounds, their only natural source is plant-based diet such as vegetable oils, seeds, nuts and legumes. Because of their potential implications for human health, phytosterols have recently gained a lot of acclaim. The emergence of scientific evidence supporting their beneficial action to reduce serum cholesterol and low-density lipoprotein (LDL) cholesterol levels and lower blood cholesterol levels has led to the promotion of plant-based diets rich in phytosterols (14).

As they are structurally similar to cholesterol they compete with cholesterol for absorption in small intestine thus causing its removal from the gut (15).

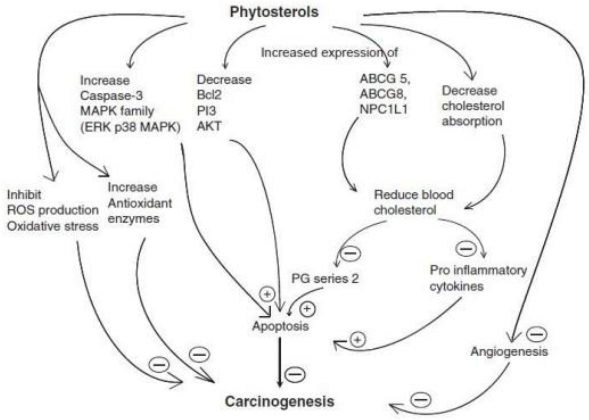

Figure 1- Proposed mechanisms of action of phytosterols on carcinogenesis

Thus, these epidemiological and clinical studies indicate the importance of including food rich in phytosterols in our diets. In previous studies, bamboo shoots are found to contain significant amounts of phytosterols, and their high levels of phytosterols are also confirmed in the current study (16,17, 18,). In bamboo shoots, major types of phytosterols are β-sitosterol, campesterol, stigmasterol, ergosterol, stigmasta-3,5-dien-7-one, stigmast-4-en-3-one (16). Bamboo phytosterols have already been shown to have several health benefits including reduction of serum cholesterol, anti-microbialactivity and chronic non-bacterial prostatitis prevention (16). Therefore, all these health benefits coupled with strong anti-cancer properties of phytosterols embedded in shoots, make bamboo shoots an exciting prospect for potential nutraceuticals to grow.

CLINICAL STUDIES CONFIRMING ANTI-CANCEROUS PROPERTIES OF BAMBOO SHOOTS

Hiromichi (2007) (17) successfully tested multiple bamboo species (Phyllostachys pubescens, Phyllostachys nigra var. henonis, Phyllostachys bambusoides, Pseudosasa japonica, Pleioblastus simonii, and Gigantochloa apus) anti-malignant tumors (Malignant sarcoma cells and Ascites tumor cells) in a mice model system. An alcoholic extract has been given to BALB / c mice induced by cancer. Tumor growth was suppressed without impairing body growth demonstrating an excellent anti-tumor activity. Other than shoots, clinical studies have also confirmed the potent anti-tumor properties of other parts of bamboo plant such as leaves and culms. Panee (2008) (20) reported that ethanol and water extract prepared from small branches and leaves of Phyllostachys edulis may inhibit the development of chemically induced breast cancer as indicated by weight gain induced by high-fat diet inhibition, hyperinsulinemia inhibition, and significant reduction in circulating TNF-α levels in high-fat diet mice. Lu et al. (2010) (17) examined the anti-tumor activity of Phyllostachys nigra var stem shavings extracts. Henonis and bamboo shaving extract showed powerful mouse leukemia (P388) antitumor activity.

ANTICANCER HERBS

Herbs for cancer, there are many different herbs for cancer that have been used for medicinal purposes by different cultures over time. In fact, plants and herbs are owed much of modern medicine. With such a wide variety of herbs in the world, it's no wonder that there are quite a few herbs that can help prevent cancer. There are also many other remedies for cancer that will help relieve the symptoms if you are already suffering from cancer treatments. Alfalfa is one of the many plants for cancer. Alfalfa is considered one of the most nutritious foods available and has very important uses to counteract the chemotherapy effects. Alfalfa has antibacterial andanti-fungal properties that make it a great cleanser for the body and fighter for infections. This acts to improve white blood cell development and replace those lost during treatment. The large amount of nutrients in these plants helps to maintain healthy levels of vitamins in the bloodstream.

Alfalfa has antibacterial andanti-fungal properties that make it a great cleanser for the skin and fighter for infections. This acts to improve white blood cell development and replace those lost during treatment. The large amount of nutrients in these herbs makes them invaluable for the restoration of healthy vitamin levels in the blood stream. Alfalfa has been researched and found to contribute to lower cholesterol levels and cancer neutralization.

Andrographis is another herb anticancer. It is an ancient medicinal herb that grows annually in Asia's

wastelands and forests. His use against cancer, Hiv and both bacterial and viral infections has been performed in many definitive studies. It has been shown that this herb has a dramatic effect in maturing cancer cells, a mechanism that seems to stop the development out of reach of cancer cells. However, extracts from the leaves of Andrographis are reported as being capable of killing cancer cells. According to studies in Japan, Andrographis has decreased the risk of cancer cells in the proliferation of the abdomen. Several independent studies with other cancers including prostate and breast cancer have also found impressive results. Herbs from anticancer come in many forms, one of which is a thistle plant type. Blessed thistle, due to its key ingredient cnicin, has a hugely positive impact on tumor size reduction.

This will reduce the fluid around the tumor, cool any inflammation in the body, and fight off bacteria. Not only this, but the anti-inflammatory properties help to rejuvenate the body and promote regeneration of Burdock, one of the most well-known anticancer herbs. The root has been used in natural medicine for centuries. Although it was originally used for liver function, joint pain and skin health burdock root has been discovered to have anti-tumor effects alongside its detoxifying qualities.

This has been shown in animal studies where it has been found that this herbal anti-cancer inhibits mutations in cells that are exposed to mutation that can cause chemicals that can lead to cancer. Mushrooms are still a very natural cure, although not really a plant. There are many characteristics as a fungus exhibited by certain types of mushrooms that are not found in plants. The Maitake mushroom, for instance, has outstanding healing properties. Mushroom extracts are most effective when used as a Maitake D-fraction, and are available as capsules or tablets.

Maitake is a proven cancer fighter. The FDA has recently approved clinical studies of a Maitake extract on participants with advanced breast and prostate cancer. American studies also show positive results on colorectal cancer and Chinese studies show positive results with liver, lung, stomach cancer and leukemia.

CONCLUSION

Phytochemicals derived from natural plant products have now gained prominence in their use as prophylactic agents in the prevention and treatment of several chronic human diseases, including cancer, which remains a leading cause of death despite the enormous advances in medical research. Shoots contain high concentrations of phenolic compounds with active radical scavenging activity and anti-carcinogenic effects by regulating ROS rates, cascades of signal transduction, angiogenesis, and cell proliferation. Shoots are also a good source of natural phytosterols such as stigmasterol, βsitosterol, and campesterol that provide anti-cancer effects through metastasis inhibition, cell cycle progression slowing, angiogenesis inhibition, cancer cell invasion and adhesion, and apoptosis induction. It is therefore very clear that bamboo shoots contain numerous arrays of phytochemicals that are highly effective in preventing and treating the occurrence of different types of cancer diseases. Bamboo, with its vast global reach, is therefore an important natural resource that has tremendous potential to prove to be one of the best allies in our ongoing effort to tame cancer. Bamboo shoots should therefore be promoted as a highly effective functional food, and efforts should be made to integrate them into any future dietary cancer prevention regimes.

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